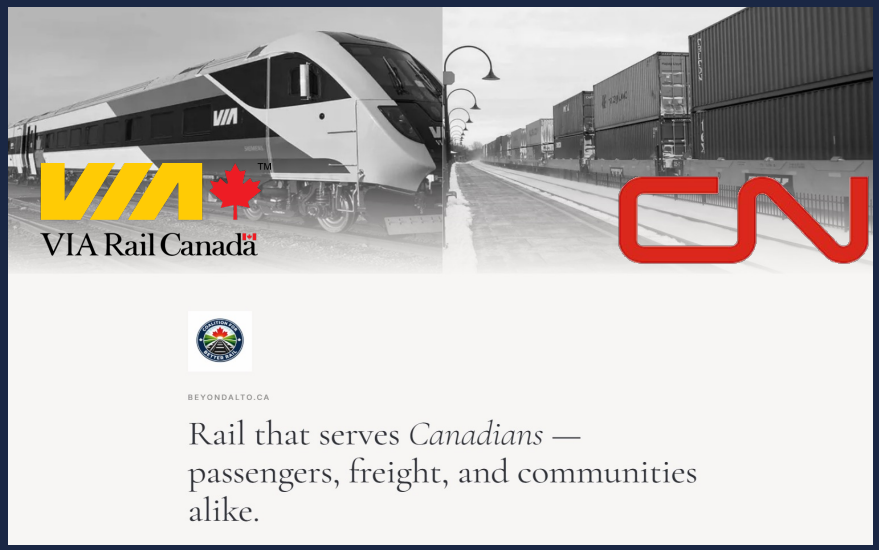
High Performance Rail (HPR)

Build One: Make One Free

A Hybrid Freight-Passenger Strategy for Ontario's Rail Future

- World-Class 200 km/h Passenger Rail Along the 401 Corridor
- World-Class Freight Rail on the Kingston Subdivision
- **Build One; Make one free.**



ALTO HSR Citizen Research Initiative | citizenresearch.ca | April 2026

Independent, non-partisan citizen research

CHAPTER 01 | HIGH PERFORMANCE RAIL | APRIL 2026

The Geopolitical Case for HPR

Supply chain sovereignty in a fractured trade environment

25%
U.S. tariff on Canadian goods

40–60%
of Ontario cross-border freight by truck

$0
ALTO supply chain benefit to Canada

~24M
ALTO ridership projection — speculative

ALTO Was Built for a World That No Longer Exists

Conceived in a period of Canada-U.S. harmony and stable CUSMA, ALTO provides zero supply chain benefit. Every dollar invested is a dollar unavailable for freight infrastructure that measurably reduces Canada's tariff vulnerability.

HPR Aligns with the Carney Trade Diversification Agenda

HPFR connects Ontario's industrial output to the Atlantic, Indo-Pacific, and Latin America via Canadian ports and CN rail — entirely independent of U.S. border crossings. Ports of Montreal, Halifax, and the Contrecoeur expansion are all within reach.

Freight Demand Is Structural; ALTO Ridership Is Speculative

HPR's HPFR revenue is anchored by contractual freight demand independent of behavioural change. ALTO's entire business case lives or dies on 24 million passengers showing up on opening day — a figure with no North American precedent.

ALTO HSR was designed for a stable, integrated North American economy that no longer exists. HPR was designed for the economy Canada actually has.

"We take the world as it is, not as we wish it to be,"

Model: If Not ALTO? What?

The case against the alternative

The Political /Geopolitical Case

The Business Case

-$21.1B	Net Present Value
~0.4	Benefit-Cost Ratio (threshold: 1.0)
$75–$113B+	Capital cost, cold-climate adjusted
$150–180B+	With Canadian P3 escalation (40-60%)

Engineering and P3 Risks

Leda Clay

Southern corridor crosses quick clay zones. High-speed ballastless track tolerances of a few mm are incompatible with differential Leda settlement. No credible cost estimate in ALTO Business Case.

Harbin-Dalian Precedent

World's only cold-climate HSR: 25% budget overrun, 20% of track rebuilt pre-opening, frost heave in engineered fills, 3-year winter speed restriction. Canada proposed at same latitude.

P3 Failure: Perpignan-Figueres

The only completed HSR demand-risk P3 in the world. Opened 2010, liquidated by court order 2016. Traffic was one-third of projections. Governments nationalised the line; private investors lost everything.

ALTO as Mechanism of Foreclosure

By occupying fiscal and political space, ALTO ensures the 401 co-construction window is missed, the HPR corridor infills, and the better option disappears permanently.

CRI ANALYTICAL BRIEF · HPFR / HPPR · APRIL 2026

Two Irreconcilable Optimisations — CN Kingston Subdivision

CN freight and VIA Rail passenger operations require physically incompatible infrastructure. Sharing the Kingston Sub forces both into a perpetual compromise.

VIA Rail Canada™

VIA Rail Canada Inc. National Railway Company of Canada — 2026 QCS 84

SUPERIOR COURT

CANADA
PROVINCE OF QUEBEC
DISTRICT OF MONTREAL

No: 500-17-133267-255

DATE: January 13, 2026

UNDER THE PRESIDENCY OF: THE HONORABLE DONALD BISSON J.C.S. (JB4644)

VIA RAIL CANADA INC.
Applicant
C.
NATIONAL RAILWAY COMPANY OF CANADA
Defendant

CN

CRI ANALYTICAL BRIEF · HPFR / HPPR · APRIL 2026

Two Irreconcilable Optimisations — CN Kingston Subdivision

CN freight and VIA Rail passenger operations require physically incompatible infrastructure. Sharing the Kingston Sub forces both into a perpetual compromise.

CN RAIL — FREIGHT	DIMENSION	VIA RAIL — PASSENGERS
Double-stacked intermodal, 200+ wagons, up to 3 km length. Slow to accelerate and stop.	Train formation	Light electric trainsets, 200–400 m. Fast acceleration and precise stopping for tight schedules.
8,000–10,000+ tonnes per service. Heavy axle loads require long clearance intervals.	Gross weight	400–600 tonnes. Low axle load; high-frequency operation requires short headways.
Moderate, continuous. Economics require low-cost running at steady speed — not burst acceleration.	Operating speed	200 km/h capability required. Every siding hold destroys journey time competitiveness.
Structurally incompatible. Double-stack container height (6.4 m+) exceeds catenary clearance envelope.	Electrification	Essential for performance, emissions targets, and long-term operating cost reduction.
Long signal blocks required. Heavy trains need extended clearance times before section can be released.	Signal spacing	Short blocks or moving-block ETCS needed for high-frequency service. Incompatible with long blocks.
Statutory freight priority on CN-owned track. Any interruption to flow is a direct commercial cost.	Scheduling priority	Precise minute-by-minute timetable. Freight-priority siding holds are structural, not exceptional.

These are not preferences that can be reconciled through better timetabling. They are physical requirements that cannot coexist on the same infrastructure. HPPR separates them: passengers on a dedicated 401 corridor at 200 km/h; freight on a liberated Kingston Sub with no passenger constraints.

CRI ANALYTICAL BRIEF · HPFR / HPPR · APRIL 2026

Two Irreconcilable Optimisations

CN freight and VIA Rail passenger operations require physically incompatible infrastructure. Sharing the Kingston Sub forces both into a perpetual compromise.

The Big Idea (HPR) – Untangling CN and VIA

Build One: Make One Free

HPFR — **High Performance Freight Rail**

CN Kingston Subdivision liberated from passengers. Dedicated freight. Intermodal hubs at Cornwall and Belleville.

HPPR — **High Performance Passenger Rail**

New 401 railway, 200 km/h, ~400 km east + ~200 km west. Co-constructed with 401 widening. Serves downtown stations via crossover spurs.

ZERO — **New GTA construction**

Freight connects through MacMillan Yard via existing CN Halton + York Subs. Passengers connect through Union Station via existing Lakeshore corridor.

Ottawa Connection

HPPR to Brockville (~310 km at 200 km/h), then VIA-owned Smiths Falls Sub to Ottawa. No new construction. Toronto–Ottawa: ~2hr 50min. 90% OTP.

Windsor Connection

VIA-owned Windsor–London corridor joins liberated Dundas Sub for 200 km/h run to Toronto. Toronto–Windsor: ~2hr 30min.

Peterborough: GO on Havelock Sub

CPKC Havelock Sub runs through Peterborough on maintained track. GO service would cost a fraction of 1% of ALTO budget. 83,000 people currently unserved.

High Performance Freight Rail (HPFR)

Build One: ***Make One free***

The Fiscal Burden of Crown CN Ownership

What continued government ownership of CN (1995–2026) would have cost Canadians

HISTORICAL SUBSIDY (1923–1993)

$96B

Total federal support in 1995 dollars — averaging $1.37B/year over 70 years of Crown operation.

PROJECTED LOSSES WITHOUT REFORM

$1.5B/yr

CN's own CEO warned in 1993 that annual losses would reach $1.5B by 1998 without drastic change.

ESTIMATED COUNTERFACTUAL COST (1995–2026)

$35–50B

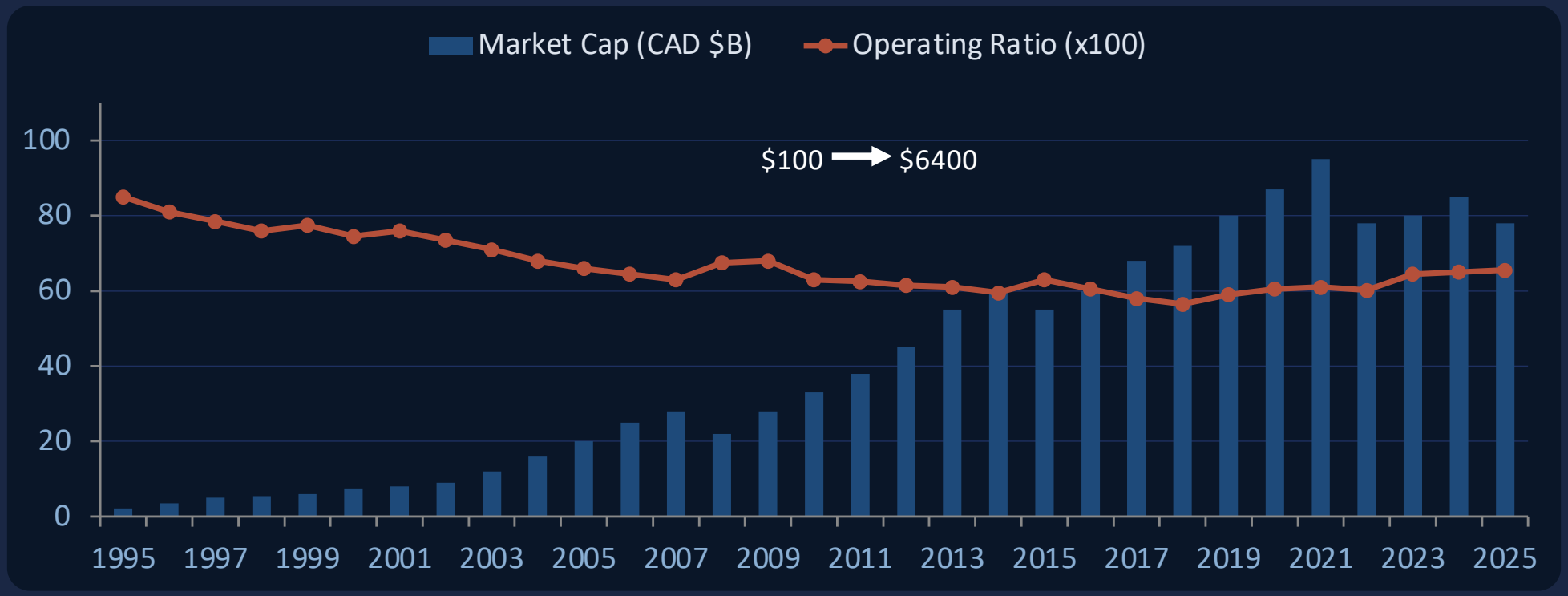
Combined losses, forgone tax revenue, forgone dividends & capital injections over 31 years.

Sources: Hansard Transport Committee (May 1995); Boardman, Laurin, Moore & Vining (2009); Frontier Centre for Public Policy (2000); ScienceDirect (2012)

CRI ANALYTICAL BRIEF · CN RAIL · 1995–2025

Market Capitalisation vs. Operating Ratio Since Privatisation

Lower OR = greater operational efficiency · Market cap in CAD $B · OR expressed as x100 (e.g. 60 = 0.60)



$2.2B
IPO market cap
1995

$95B
Peak market cap
2021

0.85→0.57
OR improvement
1995–2018

43×
Value creation
30-year multiple

CHAPTER 05 | HIGH PERFORMANCE RAIL | APRIL 2026

High Performance Freight Rail (HPFR)

The Kingston Sub as a dedicated freight corridor

$440M
Annual freight efficiency dividend at maturity

~570K–690K
Fewer truck movements/yr on 401 at maturity

4.5–5.0M TEU
Port of Montreal capacity at Contrecoeur full buildout

$3–6B
Potential 401 highway capital saving (6 vs 8 lanes)

What the Kingston Sub Becomes

Dedicated CN freight corridor — no passenger scheduling, longer trains, optimised timetables. CN throughput increases, dwell times fall, shipper reliability improves. Dangerous goods progressively rerouted off residential town-centre corridors.

Intermodal Hubs: Cornwall and Belleville

Cornwall hub: Ontario-Quebec border gateway, direct connection to Port of Montreal approach. Belleville hub: mid-corridor distribution node. Together they give Eastern Ontario its first direct intermodal rail access.

Contrecoeur: The Game-Changer

Contrecoeur's rail-at-dock design eliminates drayage cost. Combined with HPFR dedicated Kingston Sub, CN can re-establish competitive intermodal service on the Montreal-Toronto corridor — a market lost to trucking that can be recovered.

ALTO offers no connection to Contrecoeur. Its passenger corridor provides no freight function, no intermodal terminal, and no land-side port connection of any kind. The Contrecoeur opportunity is simply invisible to ALTO.

Imbleau Former CEO

2035

5-7k extra trucks/day

Community friction and the lessons for strategic intermodal planning

CASE STUDY · INTERMODAL PLANNING

CN's Milton Logistics Hub

Community friction and the lessons for strategic intermodal planning

C$250M

Project capital cost

1,600

Daily truck movements

24 yrs

Community opposition

LOCATION

East Milton, Halton Region — 400 of 1,000 ac acquired by CN, in a provincially designated employment zone.

PROXIMITY

<1 km from ~34,000 residents, a hospital, 14 schools, and two long-term care homes.

FEDERAL APPROVAL

325 mitigation conditions attached. Cabinet approved despite the EA Panel confirming significant adverse health effects.

DIESEL EXPOSURE

Federal Court (2024): no safe level of human exposure. Court of Appeal reversed, calling mitigation conditions reasonable.

FISCAL IMPACT

Milton projects ~C$7.5M/yr in foregone tax revenue; road deterioration costs borne by municipal taxpayers.

LEGAL JOURNEY

Three judicial levels — Federal Court, Court of Appeal, Supreme Court. All legal avenues exhausted by May 2025.

Key lesson for the 401 Freight Displacement Strategy: direct highway access + 2–3 km residential buffers + electrification as baseline — not as mitigation conditions retrofitted after community damage.

RAIL INFRASTRUCTURE · NORTH AMERICA

CPKC Merger

The 2023 Canadian Pacific – Kansas City Southern merger created the first single-line freight rail network connecting Canada, the United States, and Mexico — with integration ahead of schedule and capital now flowing into Mexican corridors.

THE MERGER

A cross-border Class I freight network, now integrating ahead of plan

- Closed April 2023; CP acquired Kansas City Southern for ~US$31B.
- ~20,000 route-mile network spanning three countries.
- Integration running ahead of schedule; C$220M in annualized synergies by Q2 2025.
- Target: C$1.2B annual run-rate synergies by 2027 (~60% cost, ~40% revenue).
- Operating ratio improved 180 bps to 58.9% in H1 2025.

C$1.2B
targeted annual synergies by 2027

0.59
operating ratio, H1 2025 (–180 bps)

MEXICO INVESTMENT FOCUS

Refrigerated, intermodal, and cross-border capacity build-out

- US$240M Mexico capex announced for 2025 — among the largest foreign investments in Mexico that year.
- New Nuevo Laredo double-track rail bridge — the only one of its kind, enabling joint cross-border inspections.
- Refrigerated-products terminal (Kansas City) + Americold alliance on cold-chain rail to Mexico.
- Midwest Mexico Express (180/181) and new Southeast Mexico Express with CSX (Atlanta–Monterrey in 3 days).
- New terminals at San Luis Potosí and Laredo driving record automotive and intermodal carloads.

US$240M
Mexico capex announced for 2025

3 days
Atlanta → Monterrey via SMX servic

Sources: CPKC investor disclosures (Q2 2025); BNamericas; Journal of Commerce; Trains.com; FreightWaves; Mexico Business News.

High Performance Passenger Rail (HPPR) : 220km/h

***Build One**: Make one Free*

Why 300 km/h?

Canada-equivalent cost analysis — G7 reg

3.5×

200 → N American 300 km/h cost multiplier (G7 median)

C$63M/km

G7 regression median at 320 km/h = ALTO low-end estimate

C$19M/km

HPR / 401 at 200 km/h — on the regression central trend

ALTO HSR Citizen Research Initiative · citizenresearch.ca · April 2026

Canada equivalent construction cost/km

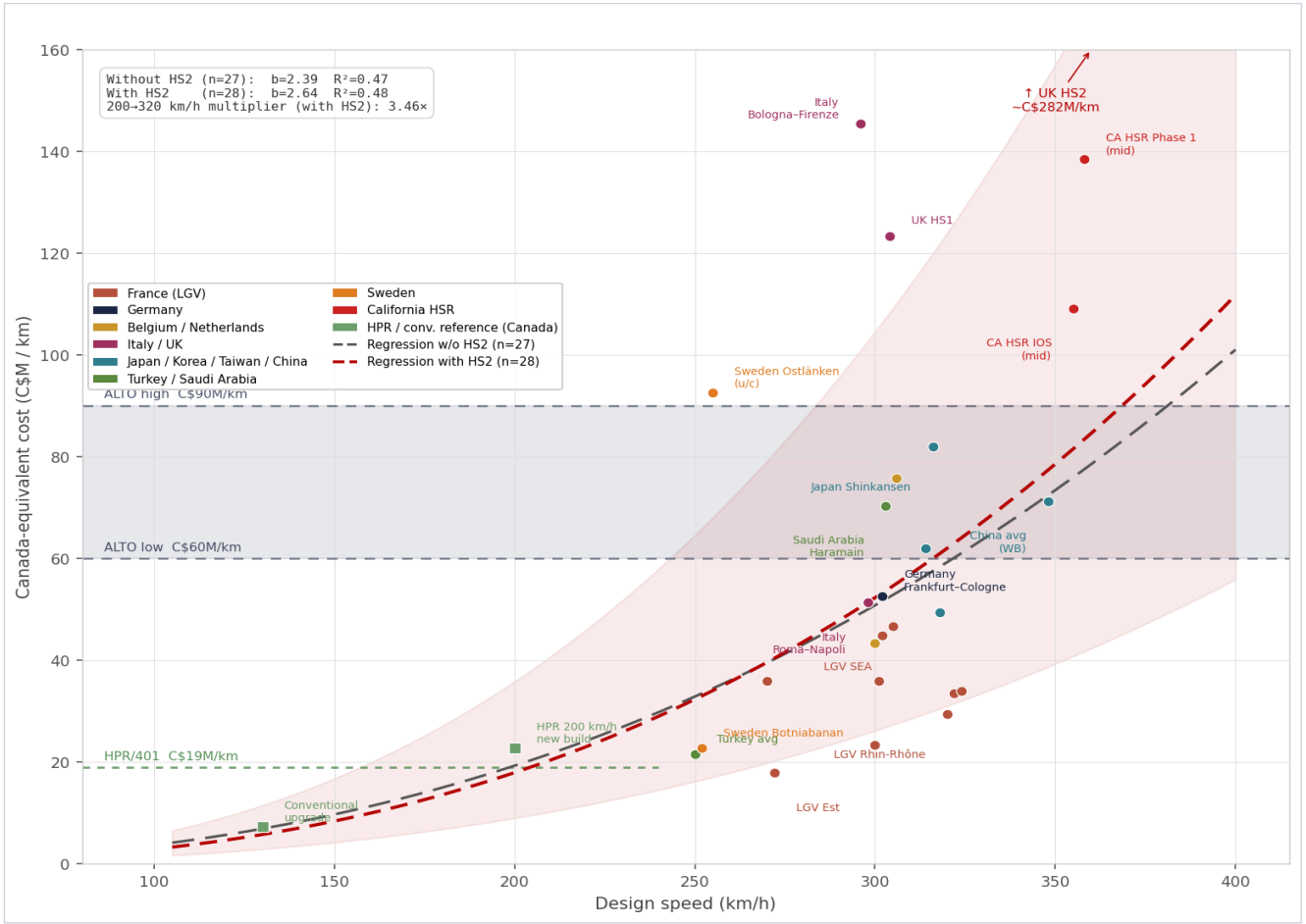


Figure 1. Canada-equivalent construction cost (C$M/km) vs. design speed. Power law regression through 27 international lines (Spain & Morocco excluded). Grey dashed = without UK HS2 (n=27, b=2.39, R^2=0.47). Red dashed = with UK HS2 (n=28, b=2.64, R^2=0.48). ALTO corridor band C$60–90M/km; HPR/401 reference C$19M/km.

THE SUPER-LINEAR COST OF SPEED

Similar relation for cars

Car base price vs manufacturer top speed, 13 production models below $400k. The engineering-economics signature of a v^3 drag × structural-wear stack.

speed^4.4

POWER-LAW EXPONENT

OLS fit on log–log, $R^2 = 0.89$

~21×

AT DOUBLE THE SPEED

doubling top speed → 21× base price

10×

TIER-ON-TIER JUMP

each tier pays 10× the previous tier's price per km/h

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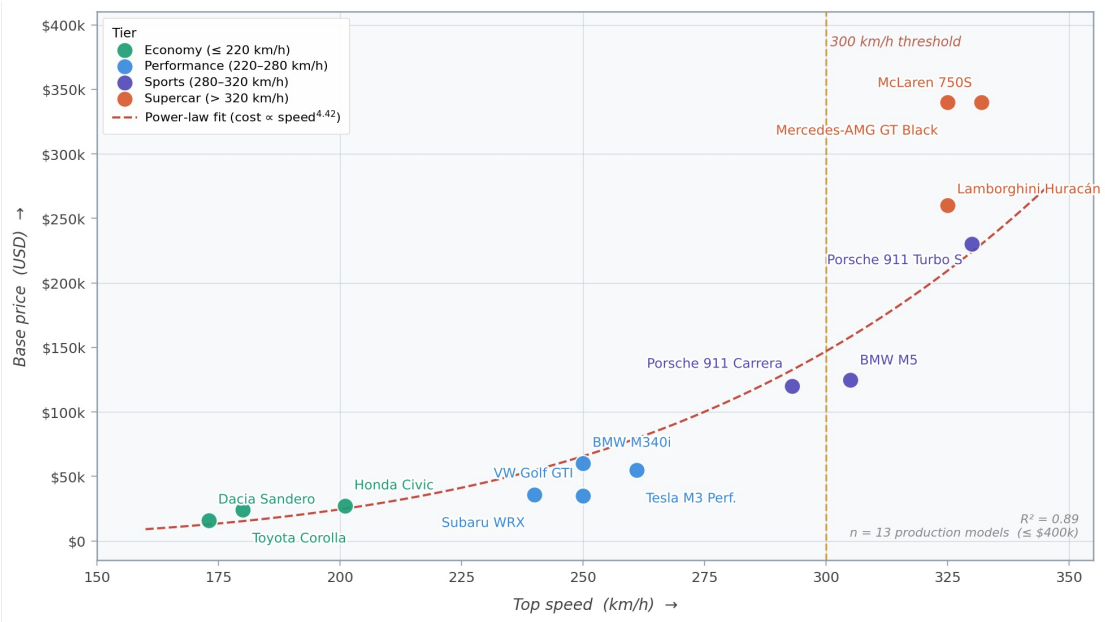


USD base price vs manufacturer top speed. OLS log–log fit through 13 production cars (prices ≤ $400k): cost ∝ speed^4.42, $R^2 = 0.89$. 300 km/h threshold shown for reference.

Why 300km/h?: Hierarchy of Rail Passenger Satisfaction Factors. Value not Desire

What passengers want — ranked by evidence

ALTO HSR Citizen Research Initiative | Literature Review, April 2026

Tier 1 — Universal thresholds | Tier 2 — Strong independent drivers | Tier 3 — Significant secondary | Tier 4 — Market-specific

Tier	Factor	Evidence basis
1	**Reliability / Punctuality**	Most consistent primary driver across all major national surveys (GB NRPS, Dutch NS, French TER, Asian HSR). Chronic unreliability depresses ridership in the long run more than any single-incident analysis implies.
1	**Safety (objective + perceived)**	Platform crowding creates direct hazards. Perceived safety is a primary functional service quality dimension for HSR. Health-safety perceptions became the dominant factor in post-pandemic demand recovery.
2	**Seat availability / crowding**	Crowding and inability to sit on long-distance services are among the highest-impact satisfaction drivers. Passengers may relocate housing or employment to avoid chronic crowding.
2	**Price / Value for money**	Leisure travellers show HSR fare elasticities of −1.1 to −1.9 (elastic demand). Long-run elasticities 2–3× short-run. Value-for-money is an independent satisfaction dimension; premium pricing without premium service quality depresses ridership.
2	**Access and egress quality**	Journey-chain research shows access/egress dissatisfaction propagates strongly to overall satisfaction. Remote or poorly-connected stations systematically underperform demand projections.
3	**Travel time / speed**	Valued, but benefits substantially mediated by whether passengers can use time productively. Standard clock-time savings models overstate benefits when conditions are poor.
3	**Thermal comfort / cleanliness**	Independent satisfaction dimensions across all markets. Air conditioning failures and uncleanliness generate acute dissatisfaction and negative reviews.
3	**Information quality**	Especially during disruption. Real-time information provision significantly moderates satisfaction loss even when service levels are poor.
4	**Noise / vibration / ride quality**	Increasingly important at higher speeds. Engineering investment required to maintain acceptable aural pressure and vibration comfort above ~250 km/h.
4	**Connectivity / Wi-Fi**	Growing importance for business travellers; strongly influences productive use of travel time and overall journey value.
4	**Ticketing ease**	Consistently rated as a high-importance dimension; affects willingness to use and re-use the service.

CASE STUDY

Finland

A measured approach to high-speed rail

220

km/h maximum

on a single 75.7 km upgraded section (Kerava–Lahti). No dedicated HSR line exists.

Population 5.5M · Severe winters · Broad 1,524 mm gauge

Strategy: upgrade before build

Despite three proposed HSR corridors and decades of planning, Finland has chosen incremental upgrades over dedicated new-build high-speed track. The approach emphasises cost-sharing, EU co-funding where available, and route-by-route feasibility over a single megaproject.

01 Tilting trains on legacy track

VR operates Alstom Pendolino tilting trains on the 1,524 mm broad-gauge network, reaching 200–220 km/h on upgraded sections rather than purpose-built HSR.

02 One corridor at a time

The €1.7B Länsirata (Helsinki–Turku) is proceeding in phases: Espoo–Lohja first, Lohja–Salo deferred to future governments. Municipalities co-fund the project.

03 No megaproject commitment

The three proposed HSR lines were estimated at €10B combined (2019). The EU declined funding in July 2024; Finland continues without a single integrated HSR programme.

Sources: Finnish Transport Infrastructure Agency (Väylävirasto); Wikipedia, High-speed rail in Finland; Aalto University (Itärata, 2024)

CASE STUDY

Sweden

From ambition to abandonment

€28B

projected cost

SKr 295B (±50B) for a 440 km Y-network — up from SKr 205B. Programme cancelled December 2022.

Population 10.6M · Standard 1,435 mm gauge · ERTMS

Strategy: pivot to maintenance

After a decade of planning a 320 km/h Stockholm–Gothenburg–Malmö network, Sweden formally abandoned its national HSR programme in late 2022. The 2026–2037 infrastructure plan reallocates roughly €45B to rail, prioritising a historic maintenance backlog and selective 250 km/h upgrades over new greenfield high-speed line.

01 Megaproject cancelled on cost

The Y-shaped Götalandsbanan/Europabanan network was abandoned in December 2022 after cost estimates rose to SKr 295B (±50B) from earlier SKr 100–150B projections — a textbook cost-overrun trajectory.

02 Design speed reduced to 250 km/h

The sole surviving new-build — Ostlänken (Järna–Linköping, ~160 km) — was downgraded from 320 km/h to 250 km/h in 2018, saving SKr 11B. Service is not expected before 2033–2035.

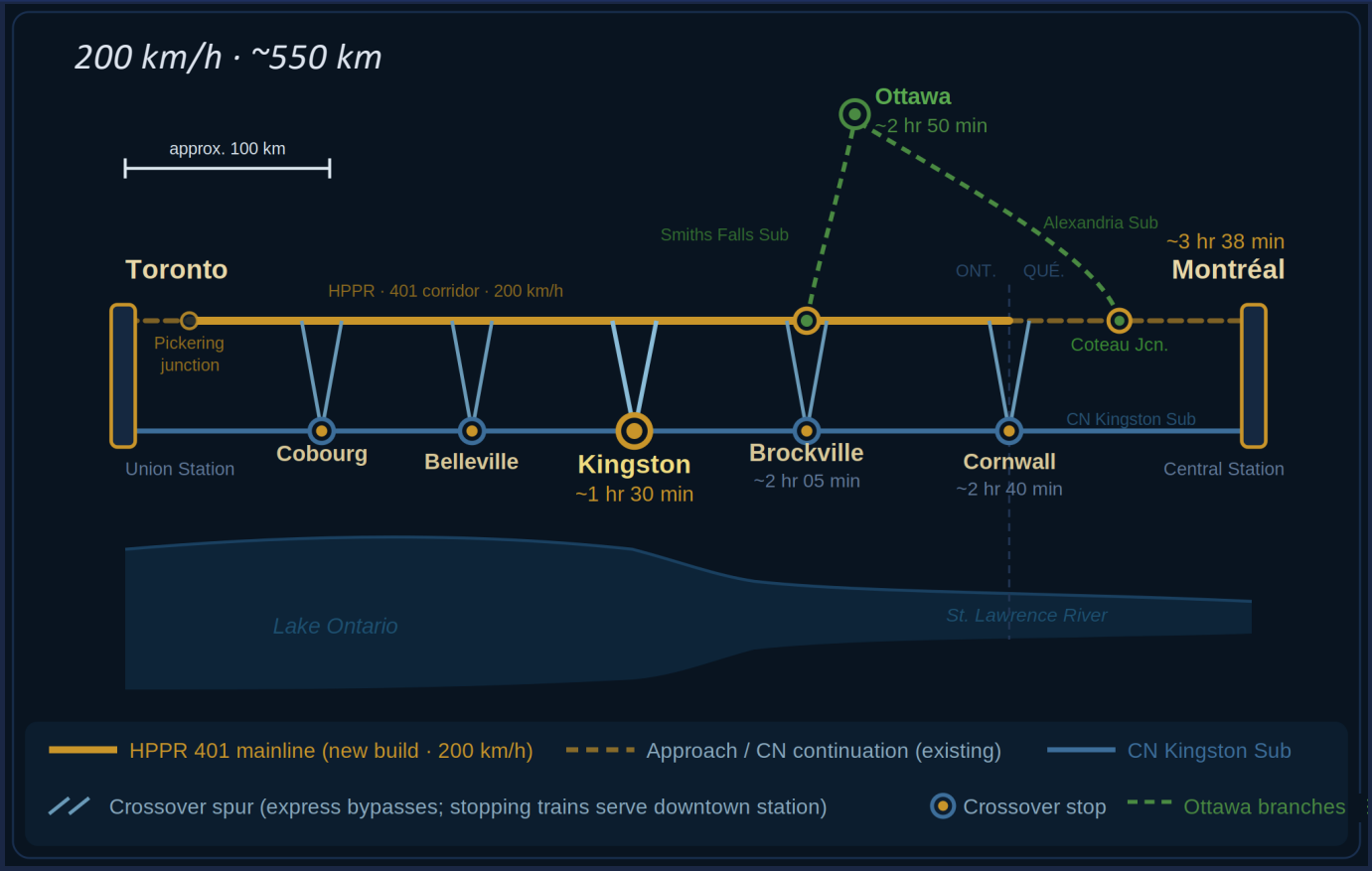
03 Maintenance backlog comes first

Trafikverket's 2026–2037 plan allocates SKr 500B to maintain and develop the existing network, aiming to clear the accumulated maintenance debt by 2050 before considering further new-build HSR.

Sources: Trafikverket (Swedish Transport Administration); International Railway Journal (Dec 2022, Sept 2025); RailTech.com (Sept 2025); Wikipedia, High-speed rail in Sweden

HPPR Corridor Schematic (Eastern) — Toronto to Montréal

High Performance Passenger Rail · 401 Corridor alignment · 200 km/h · ~550 km



High Performance Passenger Rail (HPPR)

A new dedicated railway along the 401 at 200 km/h

180 km/h average.

Key Journey Times (Express)

Route	HPPR	Current VIA	Saving
Toronto → Kingston	**~1hr 30min**	2hr 30min	~1hr 00min
Toronto → Ottawa	**~2hr 55min**	4hr 00min+	~1hr 30min
Toronto → Montreal	**~3hr 38min**	4hr 30–5hr	~1hr
Toronto → Windsor	**~2hr 30min**	4hr 00min+	~1hr 30min
London → Toronto	**~1hr 15min**	2hr 30–3hr	~1hr 30min

Lakeshore: 23 min Toronto Union to Guildwood, 35 min Toronto to Aldershot, 18min Dorval to Montreal

Crossover System

Express trains stay on 401 at 200 km/h. Stopping services diverge to existing downtown stations. No choice between speed and access.

3-Hour Modal Shift Threshold

Toronto-Ottawa at ~2hr 50min crosses the critical threshold. ECML evidence: 200 km/h rail captures >50% of the combined air-rail market at comparable journey times.

Existing Fleet

VIA Siemens Venture fleet (200 km/h capable) already procured. No new rolling stock required — unlike ALTO which needs a purpose-built HSR fleet.

The Eastern Co-Construction Window

Why now is the only time

$4–8B

Conservative estimate of foregone co-construction savings if window is missed

Available once. Cannot be recovered.

Shared Earthworks

Civil mobilisation, drainage, and compaction costs shared across highway and rail simultaneously. Separate mobilisation later adds 20–35% to civil costs.

Grade Separations at Specification

Every new 401 overpass built to rail-compatible geometry at marginal extra cost. Retrofitting later costs enormously more.

Single Environmental Assessment

One EA covers highway widening + rail co-location. A standalone HPPR project later requires a full second EA across the same sensitive corridor.

One Traffic Management Cycle

A second construction zone through Eastern Ontario — 10–15 years later — doubles disruption to freight and commuter traffic.

CRITICAL PATH: Grade separation geometry must be specified before 401 widening contracts are awarded. Every day of delay narrows the window. The 401 will not be widened again.

401 Corridor Compatibility by Design Radius

§ 8.3 CRI Research Note

Parameter	HPPR — Tilting (min. 1400 m)	HPPR — Non-Tilting (min. 2000 m)	ALTO (7,000 m)
Factor above 401 absolute minimum (832 m)	1.2×	2.2×	8.4×
Factor > 401 typical curve (~1,500 m)	0.7× (compatible)	1.2×	4.7×
Pickering → Kingston compat. %	~90–92%	~86–89%	~73–75%
Kingston → Brockville compat. %	~81–84%	~75–79%	~58–60%
Brockville → QC border compat. %	~87–89%	~82–85%	~66–68%
Eastern section total compatible %	~87–90%	~83–87%	~68–70%
Eastern section incompatible curved length	~62–77 km	~88–105 km	~122–131 km
Kingston → Brockville incompatible length	~12–15 km	~16–19 km	~31–33 km
Deviation terrain (Shield zone)	Within ROW (minor correction)	Within / adjacent ROW	Biosphere / Shield / waterfront
Land acquisition corridor width per deviation	~10–20 m (curve correction)	~20–40 m	~120–200 m (new arc sweeps)

The Eastern Co-Construction Option - Belleville

Why now is the only time

The Eastern Co-Construction Option - Cornwall

Why now is the only time

The Eastern Co-Construction Option - Kingston

Why now is the only time

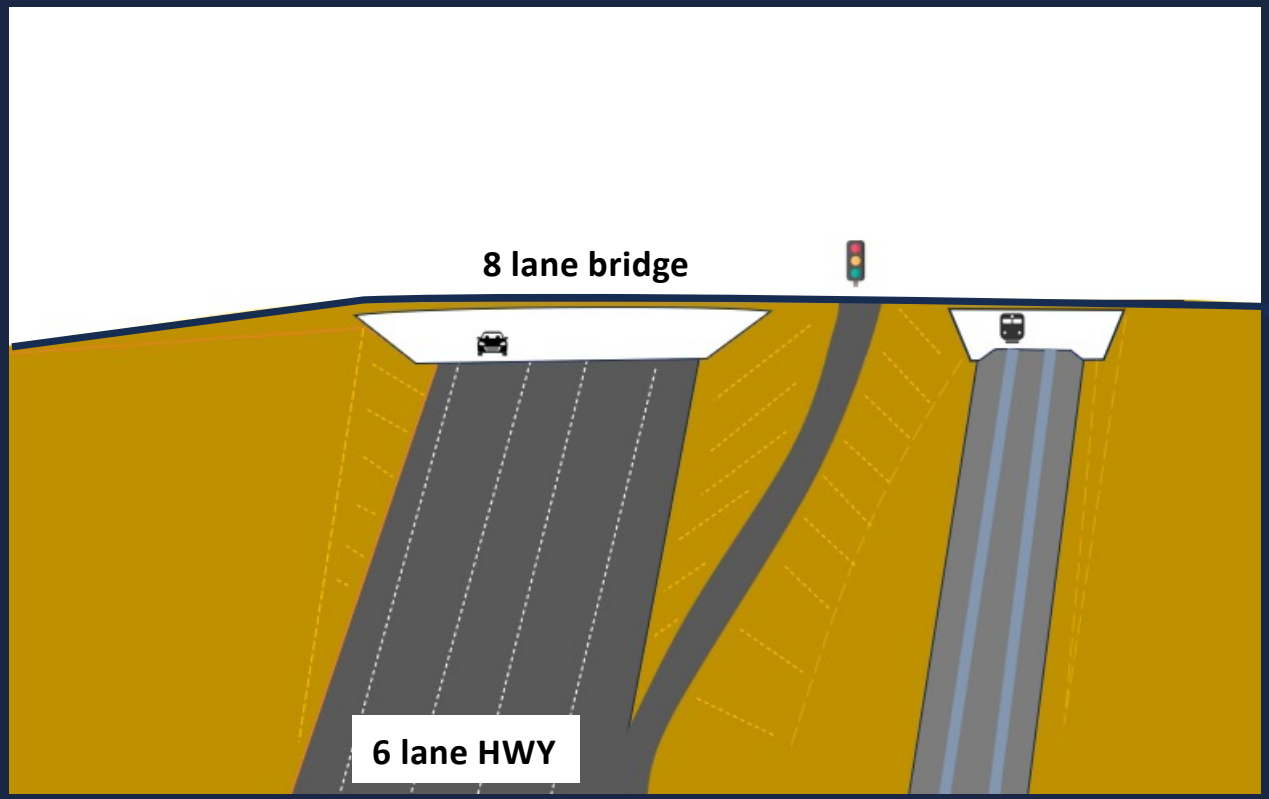
The Eastern Co-Construction Option – 416 Prescott

Why now is the only time

The Eastern Co-Construction Option

Why now is the only time

Intersections: Diamond Intersections



The Corridor is not Foreclosed Today

The $42.6 billion cost of the missed window

$42.6B

Central estimate: cost of corridor Foreclosure (2025 CAD)

Component A: Land Value Escalation — **$2.6B**

Current corridor: $20K/ha agricultural. 2060 infilled: $800K/ha blended. 2,400 ha ROW × 1.4x expropriation premium.

Component B: Construction Cost Premium — **$19.3B**

At-grade on open land: ~$28M/km. Elevated through infilled logistics corridor: $100–$200M/km. Premium across 400 km by 2060.

Component C: Foregone Benefit NPV (50yr) — **$20.7B**

Passenger modal shift ($3–8B), HPFR freight efficiency ($7.7–9.6B), GHG avoided emissions ($5.2–7.8B). Social cost of carbon at 4% SDR.

The combined cost of building ALTO and foreclosing the HPR corridor is four to six times the cost of building HPR.

This is not a marginal difference. It is the difference between a generation-defining investment and a generation-defining error.

The Infill Ratchet: interchange activation (now–2035) → logistics intensification (2030–2045) → residential infill (2035–2060) → utility lock-in (2040–2070) → corridor fossilisation (2060–2100).

The Financial Comparison

HPR vs ALTO: what taxpayers actually get

~$22B
HPR public capital
(HPPR only; HPFR CN-funded)

$75–$113B+
ALTO capital cost
(cold-climate adjusted)

>1.0
HPR benefit-cost
ratio (est.)

~0.4
ALTO benefit-cost
ratio (published)

Annual Federal Cost Comparison

Metric	HPR	ALTO
Net Present Value	Positive (est.)	-$21.1B
Annual federal cost (central ridership)	~$1.24B/yr	~$4.5B+/yr
Public capital required	~$22B (HPPR only)	$75B–$113B+
Total policy cost incl. foreclosure	~$22B	$118–$156B+
Annual operating surplus/deficit	+$57M at 6M pax	-$600M–$1.2B/yr at 10M pax

HPR requires ~$1.24B/year in net federal support. ALTO's equivalent is ~$4.5B+/year. HPR costs approximately one-third of ALTO annually, while delivering freight displacement, ecological benefits, and distributed regional economic value that ALTO cannot offer.

HPR and the Carbon Budget

The freight railway as climate infrastructure

3.77 Mt
HPR construction CO2
vs ALTO 14.69 Mt

3.9x
Less construction
carbon than ALTO

-365K t/yr
Net annual CO2
saving at central est.

~11 yrs
Construction carbon
payback (vs never for ALTO)

Annual CO2 Balance (Central Estimate)

HPPR traction + overhead (6M pax)	6,548 t/yr	Emission	84.5 Wh/pkm x Ontario grid 73.8 g CO2/kWh
HPFR freight displacement (3,000 trucks/day)	258,694 t/yr	Saving	675 g/km net truck-rail differential x 350 km avg haul
Passenger modal shift (6M pax)	113,152 t/yr	Saving	70% car, 20% bus, 10% air; 175 km avg trip
NET ANNUAL CO2 BALANCE	**365,298 t/yr**	**Net saving**	**HPR saves ~365 kt CO2/year at central estimate**

50-Year Lifecycle Balance: HPR -14.5 Mt (net saving) | ALTO +22 Mt (net emitter) | ALTO payback: never at 4–8M passengers

As EVs proliferate, ALTO's car-displacement carbon benefit shrinks. HPR's freight displacement benefit does not. The two projects' carbon trajectories diverge in HPR's favour across the entire planning horizon.

ALTO Carbon Payback — EV-Transition Fleet (2045+)

Central construction (14.69 Mt CO_2e) · Weighted displaced fleet ~73 g/pkm (50% EVs at current Ontario grid) · Most policy-relevant scenario

CARBON PAYBACK PERIOD — Central Construction (14.69 Mt) — EV-Transition Fleet Displaced (2045+)

Grid Scenario	4M passengers/yr	8M passengers/yr	12M passengers/yr
Clean grid 20 g/kWh	saving: 102 kt/yr payback: ~143 yrs	saving: 278 kt/yr payback: ~53 yrs	saving: 464 kt/yr payback: ~32 yrs
Current grid 73.8 g/kWh	saving: 8 kt/yr payback: >500 yrs	saving: 146 kt/yr payback: ~101 yrs	saving: 322 kt/yr payback: ~46 yrs
Gas-expansion 130 g/kWh	saving: Net increase payback: Never	saving: 7 kt/yr payback: >500 yrs	saving: 174 kt/yr payback: ~84 yrs

KEY FINDING — NO SCENARIO AT 4M PASSENGERS

At 4M passengers/year — comparable to early-phase ridership — no scenario achieves carbon payback within any credible operating horizon once the EV fleet transition is accounted for. On the current grid with an EV-displaced fleet, annual saving falls to just 8 kt/yr, implying payback of >500 years against a 14.69 Mt construction debt.

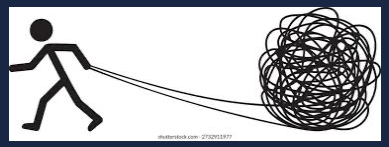
PAYBACK PARADOX — EV TRANSITION

The EV transition helps Alto (cleaner grid → lower traction emissions) but simultaneously narrows the displacement benefit (EVs emit only 10.2 g/pkm vs. 108 g/pkm ICE car). Fleet electrification outpaces grid decarbonisation in most scenarios. Ontario EVs are already cleaner than Alto HSR at any ridership level on the current grid.

 | MDPI Sustainability 2018; Canadian Geotechnical Journal 2015; HS2 Carbon Reduction Report 2024; Chester & Horvath 2010; UIC Carbon Footprint HSR 2011, 2016; IESO 2024; NRCan EV Efficiency Data

The Golden Opportunity

A defining decision for a defining moment



Five Conditions — All Aligned Now

1. Federal capital appetite for transformational infrastructure ✓

High: post-COVID recovery, national competitiveness agenda, infrastructure renewal cycle underway

2. Active civil groundworks on the preferred corridor ✓

Underway: 401 widening in planning and early execution — shared mobilisation available now

3. Public awareness of rail corridor questions ✓

Primed: ALTO consultation has activated public and political interest in intercity rail across Ontario

4. Evidence base for the HPR alternative ✓

Established: CRI research record provides engineering, financial, and environmental basis across all key dimensions

5. Window to influence 401 widening specifications !

Open but closing: grade separation specifications must be set before contracts are awarded

Build the new passenger railway now. Give the Kingston Sub to freight. Do it while the 401 crews are mobilised and the corridor is open. Or explain, fifty years from now, why a $42.6 billion opportunity was left on the table.

Social Licence

How HPR earns community acceptance and ALTO forfeits it

Eastern Ontario Wardens' Caucus Resolution 2026-02 (103 communities) on the public record against ALTO southern corridor. Municipal opposition from Rideau Lakes, Centre Hastings, Tyendinaga, Douro-Dummer. 38:1 community petition ratio against ALTO.

I. Trucks Off the 401

HPR shifts freight to rail across full 575 km corridor. Direct quality-of-life benefit for every municipality. ALTO carries zero freight — 401 congestion unchanged on opening day.

II. Environmental Acceptance

HPPR co-located with disturbed 401 corridor. ALTO cuts greenfield through Frontenac Arch Biosphere, Moira Karst hibernacula, Grey Ratsnake critical habitat.

III. Distributed Benefits

HPR: linear benefit from Windsor to Cornwall. ALTO: benefits concentrated in Toronto, Ottawa, Montreal, Quebec City. Intermediate communities bear costs without gains.

IV. Manufacturing + Supply Chain

HPFR reduces freight costs for manufacturers along the 401. ALTO provides zero supply chain benefit and zero freight impact.

V. Road/ Farm Severance

HPPR follows existing 401 corridor where grade separations already planned. HPFR is existing Kingston Sub — zero new severances. ALTO imposes fresh severance on rural road networks.

VI. K-Shaped Economy

ALTO primarily benefits urban knowledge workers (the upper K arm). Rural communities, manufacturers, and agricultural workers bear costs. HPR distributes benefit broadly across income spectrum.

VII. VIA Rail: 600,000 People Lose Their Train along lakeshore

When ALTO opens, Kingston Sub economics collapse: intermediate communities lose VIA Rail. 600,000 people affected.

What We Are Asking For

A clear, actionable policy agenda

Immediate (401 Widening Design Phase)

1. Rail co-location specification in 401 widening design contracts — grade separations built to HPPR-compatible geometry
2. Corridor protection order for the HPPR eastern alignment along the 401 right-of-way
3. Independent Parliamentary Budget Office review of the ALTO Business Case (BCR 0.4; NPV -$21.1B)

Near-Term (This Parliamentary Term)

1. Formal feasibility study: HPPR co-construction with 401 widening, eastern segment
2. HPPR crossover design study: Kingston, Belleville, Brockville and other centres
3. HPFR intermodal hub feasibility: Cornwall and Belleville sites
4. Moratorium on ALTO southern corridor expropriation pending PBO review and HPR formal assessment

Strategic (This Decade)

1. HPR designated as the preferred intercity rail strategy for the Windsor-Quebec City corridor
2. HPPR eastern segment construction commencement co-timed with 401 widening
3. HPFR intermodal hubs at Cornwall and Belleville: construction within 5 years of HPPR commitment

The ALTO HSR Citizen Research Initiative is an independent, non-partisan citizen research project. We advocate for evidence-based infrastructure decision-making in the public interest. Every claim in this document is supported by a publicly accessible research record at citizenresearch.ca.